

REMARKS

The Office Action of September 16, 2008, has been carefully reviewed, and in view of the above amendments and the following remarks, reconsideration and allowance of the pending claims are respectfully requested.

In the above Office Action, claims 1, 4, 6 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Freakes et al. (WO 2002/31461) in view of Bagdassarian et al. (U.S. Patent No. 4,393,321), Reuter (U.S. Patent No. 4,974,679) and Kusakabe et al. (EP 0710827) and in further view of Sasaki et al. (U.S. Patent No. 5,889,873) and Cullen et al. (U.S. Patent No. 4,422,055).

As set forth above, claim 1 has been amended to recite a sensor-signal transmitting conductor, as opposed to a contact spring as previously recited. Applicant submits that said recitation does not require further search or consideration by the Examiner and that entry of the present Amendment is in order.

The primary reference relied upon by the Examiner, Freakes, shows a pressure monitoring device having a flexible metal lid 5, the major surface of which forms a diaphragm which will deflect in response to changes in the pressure surrounding the monitor. The Examiner contends that the lid 5 corresponds to the claimed "rigid cover" of the present invention. Applicant respectfully disagrees. The flexible diaphragm 5 (as defined by Freakes), which has a load bearing capability of less than 10kg (as explained below), cannot be compared with a substantially rigid cover capable of carrying a mechanical load of more than 50kg, as recited in claim 1.

The load bearing capability of the Freakes device is evident from page 5, lines 9-13, and page 6, lines 11-15. Because the size of a typical tire pressure monitoring device is less than 1cm², and the maximum pressure difference over the lid is said to

be 2-10 bar, the maximum load bearing capability of the lid 5 is less than 10 kg. This force, and even the force of 1 kg, caused by the pressure difference over the lid 5, shall deflect the lid (flexible diaphragm) and thereby transfer the force onto the substrate 7 carrying the SAW devices. The force is used to bend the beamlike substrate 7 such that the resonant frequency of the central SAW device Y is changed in response to the force. Therefore, lid 5 cannot be rigid in the sense of the presently claimed invention, because a rigid lid would adversely affect the sensitivity of the device and there would be no dynamic signal in the output of the SAW devices.

As cautioned by the Federal Circuit, where a modification of the prior art device would render such device inoperable for its intended purpose, the mere fact that the prior art device could be so modified would not have made the modification obvious. In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984). Accordingly, Freakes teaches that a flexible diaphragm is used as the lid of the monitoring device and, for the reasons explained above, there is no motivation for replacing the same with a rigid lid, as in the claimed invention, since doing so would render the disclosed device inoperable for its intended purpose.

Still further, the Examiner contends that the substrate 7 of the Freakes monitoring device corresponds to the flexible diaphragm of the claimed invention. Applicant respectfully contends that one skilled in the art would not interpret a bendable beam of very a hard material a "flexible diaphragm", as recited in claim 1. As explained in the second to last paragraph of page 5, the substrate 7 in Freakes must be free to bend as a rigid beam. That is, its ends 8, 9 must be free to move

(via a flexible adhesive) and it thus could not be fixed between the cover and the body as the rim of the flexible diaphragm, as in the claimed invention.

Replacing the substrate 7 and the SAW devices of Freakes by those of Bagdassarian does not change the situation, because the substrate 1 of Bagdassarian is also made of a very hard material in which Surface Acoustic Waves (SAW) can be propagated. According to Bagdassarian, such a substrate material is, for example, a piezoceramic material based on a lead-zirconate titanate (column 4, lines 43-45). A skilled person knows that this material is very hard and can not be defined as a "flexible diaphragm". This piezo-ceramic substrate is used in the transducer of Bagdassarian to change an electrical signal into a mechanical vibration of the substrate which vibration is then changed back into electrical signal (electrical-mechanical-electrical transducer). Thus, the piezo-ceramic substrates of Freakes and Bagdassarian SAW devices are not comparable with the flexible diaphragm of the claimed invention, which only functions as a prestressed and sensitive support diaphragm for the piezoelectric ceramic sensor diaphragm attached onto the flexible diaphragm. Accordingly, Applicant submits that there is no "flexible diaphragm" as in the claimed invention disclosed or suggested by the devices of Freakes and Bagdassarian.

The invention of claim 1 differs substantially from any prior art in that:

- the piezoelectric sensor diaphragm is applied onto the surface of a flexible diaphragm, and
- the combination of such diaphragms is mechanically prestressed by the load bearing rigid cover.

The following additional features of claim 1 further set forth a clear distinction over any combinations of prior art.

The sensor signals of the SAW devices of Freakes are not transmitted by contact, as defined in claim 1, but rather, Freakes provides suitable antennae for receiving an excitation signal for each of the SAW devices and for transmitting a response signal from each of the SAW devices (page 6, lines 3-5). One skilled in the art would not be motivated to replace the antennae of the SAW devices of Freakes with the wires of Kusakabe or the spring contact of Sasaki, because the pressure monitoring device of Freakes is intended for applications (such as measuring of tire pressure) where wireless signal transmission is desired. Bagdassarian, in turn, shows current conducting pads 10 and 11 for the corresponding electrodes 5 and 8.

In the presently claimed invention, the opposite polarities of the signal generated by the piezoelectric ceramic sensor diaphragm in response to extremely minor changes of its prestress condition are connected – on one hand – by the metal foil (flexible diaphragm) directly to the frame and – on the other hand – by the contact conductor (spring) to the amplifier input. With the SAW devices of Freakes such a direct signal output is not possible.

Furthermore, although Cullen teaches a rotationally symmetrical sensor diaphragm, a skilled person would not use it in the SAW devices of Freakes, because (contrary to the Examiner's assertion) it would decrease the sensitivity of the Freakes device. That is, if a long piezo-ceramic substrate in the form of a freely bending beam is replaced by a round peripherally supported rigid piezo-ceramic substrate, more force (and higher pressure) would be needed for its bending. The situation is completely different in the present invention wherein a flexible diaphragm

(metal foil) is prestressed by a rigid cover itself, and not only by a pressure difference over the flexible cover as in the device of Freakes. In the present invention, the rigid cover prestresses the piezoelectric ceramic sensor diaphragm by mediation of the flexible diaphragm. This novel construction of the claimed invention thus results in an unexpected function, enabling new applications where the loading forces of the sensor can be millions of times higher than the changes of forces which can be measured (measuring sensitivity). This simply is not the case in the cited prior art devices.

In view of the above, Applicant respectfully submits that the invention of claim 1 would not be obvious to one skilled in the art.

Claim 3 further recites that the flexible diaphragm is made of metal and has a peripheral rim secured between the edges of the frame and the cover. Based on the same grounds as above, Applicant respectfully contends that one skilled in the art would not use the constructions of Cullen and Guscott in the device of Freakes, without adversely effecting the operability thereof. Freakes uses with full purpose and for good reason the disclosed long, rectangular, freely bending beams as substrates 7 of the SAW devices -- there is no motivation and thus no suggestion for securing the same between the frame and the cover. As such, Applicant submits that claim 3 is not rendered obvious by the cited prior art.

A detailed discussion of the additional distinguishing aspects of the remaining dependent claims is not set forth at this time as the dependent claims are allowable by virtue of their dependence from allowable independent claim 1.

CONCLUSION

In view of the above amendments and remarks, Applicant respectfully submits that the claims of the present application are now in condition for allowance, and an early indication of the same is earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference would be helpful in resolving any remaining issues pertaining to this application; the Examiner is kindly invited to call the undersigned counsel for Applicant regarding the same.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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By:



Wendi L. Weinstein

Registration No. 34456

P.O. Box 1404
Alexandria, VA 22313-1404
703 836 6620